

PATENT SPECIFICATION

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DRAWINGS ATTACHED.

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COMPLETE SPECIFICATION.

Improvements in or relating to Dental Apparatus.

I, DONALD GEORGE SMITH, a Citizen of the United States of America, of Suite 301, 299 Alhambra Circle, Coral Gables, Florida 33134, United States of America, do hereby
 5 declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to dental apparatus for recording and reproducing the movements of a patient's jaw, whereby recorded information may be reproduced to a high degree of accuracy.

15 In dentistry, dentures, full dentures, inlays, bridges and the like are constructed by using a model holder or articulator to reproduce the positional relationship between the upper and lower jaws of a patient, together with
 20 the relative movements of these jaws, thus permitting the "bite" and "grinding" patterns of the patient to be reproduced subsequently in a dental laboratory.

25 In order to reproduce the relative positions and movements of a patient's jaws, the model holder must be adjusted and "set" in accordance with the characteristics of the individual patient treated. This is done by using wax bite recordings which are made
 30 in the mouth, and subsequently removed from the mouth and set up in the model holder, e.g. between the upper and lower models. The model holder is then adjusted in accordance with the bite recording made,
 35 and is "set" and the dentist or laboratory technician can then start to construct the required dental restorations using the model holder, thereby relieving the patient of the burden and discomfort of having extensive
 40 adjustments made in the mouth.

In my co-pending Application No. 31092/62 (Serial No. 1,040,296), there is
 [Price 4s. 6d.]

provided dental apparatus in which a plurality of recordings are made simultaneously in a mouldable material, each recording
 45 being a three-dimensional one, and the said mouldable material being so carried by a first support as to occupy predetermined spaced apart positions, a second support for
 50 scribes engageable in the mouldable material, said two supports being provided with means to relate them temporarily fixedly relative to the patient's jaws, and being
 55 transferable to a model holder for using the recordings and the said scribes carried by the supports to reproduce the movement of the patient's jaws.

In my said co-pending Application, it is proposed to load the mouldable material in three cups carried by a substantially U-
 60 shaped frame, disposed extraneously of the patient's head, whilst inside the patient's mouth are provided two trays shaped to mate with the palate and tongue recess of the opposed jaws, these trays having project-
 65 ing forwardly from them a pair of substantially horizontal thin rods, the lower one of which is adjustably secured by suitable fastening means to the aforesaid U-shaped
 70 frame, and the other one is likewise secured to a substantially similar frame disposed above the latter mentioned frame, the upper frame carrying the scribing projections,
 75 which inscribe in the material in the said cups, recordings corresponding to the movements of the patient's jaws.

In the present invention, the recordings are made inside the mouth and apparatus is employed which considerably simplifies
 80 the necessary operations, and ensures a high degree of accuracy, whilst saving time in the production of the recordings. The present invention also enables a holder for the models to function as an articulator in a very easily

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handled manner by the technician, by reason of the means for controlling the movements of the models being secured directly to the models. However, in the present invention

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the models need not be mounted in a model holder or articulator as it is possible to make a test by holding the models in the hands.

According to the present invention, dental apparatus for use in obtaining recordings of the movements of a patient's jaws, which recordings are usable for reproducing said movements with models of the patient's jaws, comprises an upper mounting and a lower mounting, means with said mountings by which they are temporarily connectable relatively fixedly inside the patient's mouth to the patient's upper and lower jaws respectively, co-acting devices carried by the said mountings adapted to make recordings of relative movements of the patient's jaws for use after removal from the patient's mouth in reproducing such movements with models of the patient's jaws.

Further, in accordance with the present invention, dental apparatus for use in obtaining recordings of the movements of a patient's jaws in order to be able to use the recordings for reproducing said jaw movements, e.g. by hand, or mechanically in an articulator, in previously prepared models of the patient's jaws, comprises an upper support member and a lower support member fixable inside the patient's mouth to the patient's upper and lower jaws respectively and transferable to corresponding parts of the models of the jaws, one of said supports carrying scribes and the other being adapted to carry a mouldable material in which the scribes trace three-dimensional recordings representative of the movements of the patient's jaws, whereby upon hardening of the mouldable material subsequent to the formation of said recordings, the models with the said supports secured thereto will be displaceable under the control of the inter-engaging scribes and said recordings, to reproduce the said movements of the patient's jaws.

Further, in accordance with the present invention, dental apparatus for obtaining recordings of movements of a patient's jaws for the purpose set forth, comprises a pair of thin rigid plates shaped for location parallel with each other between the palate and tongue of the patient, positionally adjustable anchorage members at the peripheries of said plates to secure them to the upper and lower models of the patient's dentures and to locate the said plates in corresponding positions in the patient's mouth, a pair of mounts for said plates adapted to be secured relatively fixedly to the palate and tongue areas of the two models, means to secure said plates temporarily fixedly to said

mounts, a plurality of scribes in the form of stems projecting from one of said plates towards, when in use, the other of said plates and formed with part spherical free ends, means in the other of said plates to receive in opposition to each of said stems a charge of recording wax in which the free ends of the said stems are engaged to make the recordings, and resilient means interposable between said plates to yieldingly oppose bite actions of the jaws of the patient, said stems by their free ends being adapted to form in respective ones of said recording wax charges intaglio guideways representative of the movements of the patient's jaws.

A model holder for testing the models by means of said recordings, desirably comprises a lower bow frame or plate to carry the lower model and an opposed upper bow frame or plate to carry the upper model, the upper of said frames or plates being articulated at one end to a vertically adjustable support upstanding from the lower bow frame or plate.

Drawings are appended herewith, illustrating an embodiment of the invention, and wherein:

Figure 1 is an exploded perspective view of the integers of the apparatus, and in which the upper plate and the lower plate expose their opposed surfaces.

Figure 2 is a perspective view of the upper plate showing the location in its lower face of the wax recordings.

Figure 3 is a somewhat diagrammatic side elevation view showing the proper spacing of the two plates and their location in the upper and lower models.

Figure 4 is a top perspective view of an upper model showing the arrangement of die pins for attachment of tooth dies to the model.

Figure 5 is a perspective view of a suitable articulator or model holder.

Figure 6 is a side elevation view of the model holder shown in Figure 5, and showing the upper and lower working models in position.

Figure 7 is a detail sectional elevation on the line V—V of Figure 5.

Figure 8 shows somewhat diagrammatically and in perspective a known device for obtaining transfer of the relationship of the upper teeth to the axis of opening and closing rotation of the lower jaw known as the hinge axis.

Figure 9 shows the device of Figure 8 when attached to an articulator in which the models are subsequently secured for reproducing the movements of the patient's jaws.

Figure 10 is an underneath perspective view of the upper plate adapted to carry mouldable material in which impressions are

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made by scribing devices on a lower plate.

Figure 11 is a side elevation view showing the lower plate secured to the lower model, and

5 Figure 12 is an exploded view showing the underneath of the upper plate when secured in a patient's upper jaw and also the lower plate, the latter now showing its attachment to the lower jaw.

10 Referring to the drawings, the chief parts of the dental apparatus are shown in Figure 1, and include an upper plate 1 and a lower plate 2, with which are associated means for mounting them in the upper and lower models which are shown as casts 3 and 4 respectively (see Figures 3 and 4).

The latter mentioned mounting means are shown in Figure 1 as opposed to the upper and lower faces respectively of the plates 1 and 2, against which faces the mounts are secured, the upper mount being indicated by the reference numeral 5, and the lower mount by the reference numeral 6. Each mount comprises a substantially triangular plate, 25 the upper plate having three or other convenient number of vertical legs 7, and the lower plate having a similar arrangement of depending legs 8, the corners of these plates desirably being radiused, and the legs 7 and 8 extending vertically from such corners.

The legs 7 and 8 are provided with grooves 7a and 8a near their free ends, and where they are fixedly secured at their inner ends to their respective mount plates 5 and 6, they have threaded bores aligned with holes in the mount plates 5 and 6 to receive screws 9 passed through holes 10 in the upper and lower plates 1 and 2, and formed with milled heads for convenience of handling, whereby the upper and lower plates 1 and 2 are secured firmly to the mount plates 5 and 6 respectively.

45 In practice, the mount plates 5 and 6 are, at one stage of the operation, fixedly secured to respective upper and lower models 3 and 4, as hereinafter described, by setting their legs 7 and 8 in complementary holes bored in the palate and tongue areas of the models 3 and 4, a self-setting plastic material being used in the holes to key in the grooves 7a and 8a.

The opposed faces of the upper and lower plates 1 and 2 are provided with means for obtaining a permanent recording of the movements of a patient's jaws, such movements being those required by the dentist for controlling corresponding test movements of the two models when mounted in a suitable model holder. For this purpose, one of the plates, shown as the lower plate 2 for preference, is provided with three scribing members in the form of upwardly projecting and rearwardly inclined relatively rigid stems 65 11, two of which are secured to the plate

near the rear corners thereof, and the other to a symmetrical point near the radiused front edge of the plate 2.

The free ends of the stems 11 are formed with part spherical knobs 11a joining their stems by necks 11b, and this form of stems is found to be suitable for scribing in a modelling compound, such as self-setting wax or modelling clay, the relative movements of the patient's jaws decided by the dentist during testing the characteristics of the patient's jaws. The modelling material which receives the imprint of the movements of the free ends of the stems 11 is shown in Figure 2 as three pieces of modelling clay 12, keyed by digital pressure in holes 13 in the upper plate 1, the material being manipulated to the necessary thickness to occupy the proper vertical space between the plates 1 and 2. This thickness can be determined by a jig 11c (Figure 11) placed over the knobs 11a when the plates 1 and 2 are temporarily mounted in the models 3 and 4, as shown in Figure 3.

Proper location of the plates 1 and 2 90 relative to the models 3 and 4, and corresponding location thereof in the patient's mouth, is obtained by means of four thin rigid pins 14 bent at one end where they are engaged in four holes 15 formed in the plates 1 and 2, two holes being near the rear corners and the other two near the parts where the side edges of the plates merge into the curved front edges of the plates. The bent ends of the pins 14 are keyed in the holes 15 by a self-setting plastic material, and the pins thus form four spider-like legs projecting outwardly from the plates 1 and 2 approximately radially relative to the centres of such plates.

A line joining the centres of the two plates may be regarded as containing a datum point or position, relative to which movement of the upper and lower plates 1 and 2 respectively, are transmitted via the stems 11 to the recording material 12, so that the knobs 11a on the stems form cam-like depressions 16 (see Figure 2) in the pieces of material 12 which are characteristic of the movements of the jaws, each cam-like formation having a starting or datum point 16a (see Figure 2) where the appropriate knob 11a is located when the two jaws are in their normal relationship.

Pressure of the jaws together is cushioned 120 by suitable resilient means such as e.g. a coiled compression spring 17, at its ends seated in sockets 18 formed at approximately the centric positions of the plates 1 and 2. This spring 17 is shown to the right 125 of Figure 1 and broken short between the plates 1 and 2.

The manner of use of the apparatus is as follows:—

After the final master models 3 and 4 130

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have been obtained, and so-called "wax or plastic bite rims" have been made by locating a layer of wax or plastic material 41 between the patient's upper and lower jaws and obtaining bite impressions in such layer, assuming that we are dealing with removable dentures, the upper and lower models are mounted temporarily on a model holder or hinge-type articulator with an approximately accurate wax centric record by mating the upper and lower teeth of the two models in the wax or plastic bite records made in the said layer of wax 41. A desirable form of articulator is shown in Figures 5 and 6.

In Figure 8 is shown how the layer of wax 41 is located in the articulator of Figure 5 in the position to be engaged by the upper model 3, the layer of wax being carried by a rod 42 secured to a transverse rod 43 by a clamp 44, the transverse rod 43 being secured by clamps 45 to a pair of side rods 46 provided at their rear ends with pointed hinge pins 47 which engage in recesses in the ends of a hinge axis rod of the articulator, these pins 47 having been located by known means on the patient's hinge axis.

The proper size upper and lower plates 1 and 2 are now selected and positioned between the mounted models 3 and 4 so that proper distance between them is allowed for adequate thickness of the recording material 12, and as already mentioned, this can be arrived at by means of a jig 11c (see Figure 11) placed over the knobs 11a. It is also important to select the plates 1 and 2 and to position them so that maximum width or separation between the recording knobs 11a is obtained without encountering the teeth or gums as an obstruction to movement.

Maximum separation of the knobs 11a is desirable for more accuracy of recording, since the closer we get to having them all occur at a point, the less accurate will be the result. They may be as close to the molars as three quarters of the Bucco-Lingual thickness of the molar teeth since they only have to travel one half the width of the molar to record movements out to the tips of the cuspids which is all that is required. The other quarter tooth width simply allows room for removal of the dies from the model. Die pins for the tooth dies incidentally, should be angled outwards to allow for easy removal from under the edge of the plates. This outward angling of the die pins is indicated by the reference numeral 19 in Figure 4.

After the correct sizes and positions of the plates 1 and 2 have been selected by holding the plates on the models with modelling clay, they are lightly "tacked" or indexed to their models 3 and 4 with pieces 3a, 4a (see Figure 3) of a plastic material or hard wax so that upon removal they may be repositioned to the same places.

Following this removal, the plate mounts 5 and 6 are attached to the plates 1 and 2 with the screws 9, and proper holes with undercuts are prepared in the palate area of the upper model and tongue area of the lower model in order to receive the legs 7 and 8 of the plate mounts, and to allow room for the self-setting plastic material which will firmly lock the legs of the plate mounts to the models.

When this fitting and cutting has been completed, these plates and plate mounts assembled thereto, are placed again into the indexed positions on the models and the legs 7 and 8 of the plate mounts are fixed to the models with a suitable setting plastic material.

The models are now lubricated with a petroleum jelly, and the spider-like legs 14 are fitted and fixed to the plates 1 and 2 by a suitable cementing medium inserted in the holes 15, and at the free ends of these legs small pads 20 of dough-like plastic material are fitted to the legs to form the bearing surfaces over the tops of, and in between the prepared teeth. These legs 14 must be positioned so that they will not interfere with jaw movements when subsequently placed in the patient's mouth during the appointment with the patient for obtaining the recordings. The legs 14 must be very firm and rigid and must accurately transfer the plates 1 and 2 from their settings in the models to the exact positions on the teeth in the patient's mouth.

With these legs 14 and pads 20 of suitable plastic material attached to the plates 1 and 2, the two plates are prepared ready for making recordings in the mouth. This is done by placing both plates 1 and 2 in the mouth on the cleaned prepared teeth (or on gums, if partial removable dentures are being made using plastic or wax bite rims to hold the plates, the spider-like legs 14 are not necessary), and the spring 17 is now sprung into the sockets 18.

The dentist now checks all movements made by the patient's jaws, right, left, forward and all around for any interference. The two plates are now removed from the patient and the softened hard wax or modelling compound 12 (see Figure 10) is added to the three areas where the recordings are to be made, making sure that this compound is firmly locked in the holes 13 in the plate 1.

With the new soft recording wax 12 in position, return the plates 1 and 2 to the mouth with the spring 17 in position, and the patient is instructed to go through all possible movements in order to make each of the knobs 11a form a three-dimensional intaglio marking or guideway 16 (see Figure 10) in the material 12 of the jaw movements at each of the positions.

It will be seen that the stems 11 carrying the knobs 11a have a backward inclination

relative to the plate 2, and the purpose of this is to form a lip or rim 16*b* along the back part of the wax or plastic recordings so that the knobs will ride within, or be limited or guided by this rim later when manipulated in the articulator by the dentist or technician.

When the dentist is satisfied that the recordings made by the knob 11*a* have included not only the right and left extreme border movements of the jaws, but all movements within the functional range of tooth contact, then the plates are carefully removed.

A centric relation "bite" record 41, and either a face bow record, or a more accurate hinge axis transfer record is taken, and as already mentioned with reference to Figure 9, this latter record is used to relate the upper cast to the articulator, or model holder.

The patient can now be provided with temporary restorations and allowed to go, and the recording patterns in the pads 12 are either cast in a low fusing metal against a stone counter poured against the wax, or they may be cast in aluminium. In the event of these recordings having been made in a self-setting plastic material, they are already available for use without this latter mentioned operation.

The upper model 3 is mounted on the model holder shown in Figures 5 and 6 with the aid of the face bow record or hinge axis transfer 41—47. The model holder must be closed in the so-called centric lock state during this mounting operation, this closed state being set by the engagement of the pointed upper ends of two posts 21, 22 axially adjustably secured at their lower ends in the lower plate or bow frame 31 of the articulator (see Figure 5) with the lower ends of two posts 23, 24 secured axially adjustably in bosses 25, 26 respectively on the upper plate or bow 30 of the articulator. The plates 1 and 2 are re-attached to their respective plate mounts 5 and 6 by the screws 9, and the instrument is now ready for use.

The model holder shown in Figures 5 and 6 affords a somewhat universal or "free wheel" action, and consequently affords full freedom of movement so that the movements are guided only by the knobs 11*a* acting along the recordings in the hardened recording material.

No attempt is made to use or transfer an axis orbital plane or any other facial horizontal plane or reference, since with this instrument, the influence of the condyle paths and incisal guidance are blended together and traced in position in a fixed and unchangeable relation to the maxilla and the articulator fossa and its articulating eminence. Therefore, one is not faced with the

possibility of making an angular mistake about the hinge axis in positioning the upper cast relative to the condyle paths.

The upper solidified records would still be usable on opening the bite, if the lower plate with its assembly of knobs 11*a* were moved up to contact them in the same positions as before in the centric position but only if opened along the hinge axis. The use of a hinge axis mounting allows for the taking of possibly more accurate slightly opened centric records and then closing to tooth contact after mounting the lower model.

The centric lock on the model holder can be used at will to hold the models in the centric position, and for this purpose the model holder (see Figure 5) includes upper and lower so-called bow frames in the form of the upper plate 30 and the base plate 31 already referred to. The base plate 31 has fixed to it a centric lock in the form of two tubular posts 32 in which telescope two limbs 33 cranked upwards from an integral horizontal part 33*a*, these limbs and the part 33*a* being made from stiff circular section rod. The part 33*a* is split diametrically as shown at 33*b* in Figure 7, and this split is continued into the lower end part of the limbs 33 and splayed so as to distend the part 33*a* which at its ends, slides in opposed slots 34 in the posts 31 to afford a close frictional sliding engagement of the part 33*a* in the posts. The ends of the slots 34 are enlarged as at 34*a*, whereby at the upper and lower terminal setting positions of the rods 33, the split part 33*a* will spring into the enlargements 34*a* of the slots to form a lock.

The upper ends of the limbs 33 are formed with lugs 35 in which are formed rearwardly facing notches 35*a* in which seat closely co-axial horizontal pins 36 concentric and integral with a circular section bead 37 integral with the rear end of the upper bow or plate 30, the ends of which bead abut firmly against the opposed faces of the lugs 35. It will be understood that instead of two pins 36 a single pin may be threaded axially through the bead 37.

It has already been described with reference to Figure 9, the manner in which the upper model 3 is initially located in relation to the upper bow or plate 30 by engaging the teeth of the upper model in the bite recording wax member 41, and, as shown in Figure 6, it will be understood that once the proper position of the upper bow or plate 30 has been set by means of the adjustable rods 23 and 24 set into engagement with the pointed upper ends of the rods 21 and 22, and consequently, the exact thickness of plaster 49 required for securing the upper model 3 to the upper bow or plate 30 is easily arrived at and this plaster is then secured to the disc or boss 38 carried by the upper bow or plate 30 and provided with

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dimples for anchoring the plaster thereto. Figure 6 shows somewhat diagrammatically this attachment of the upper model to the upper bow or frame 30.

5 It will also be understood that the lower model 4 is similarly attached to the lower bow or plate 31 by registering the teeth thereof with the pre-formed indentations in a separate record of wax or other suitable material, this separate record desirably not being the record 41, although the record 41

10 may be used if it proves to be sufficiently accurate. A body of plaster 50 secures the lower model to a boss 39 carried by the lower bow or plate.

15 The rear vertical pins 22 and 24 are located slightly in advance of the plane containing the axis of the pin or pins 36 and afford a "limit stop" for setting the proper vertical travel of the limbs 33, whilst the pins 20 21 and 23 by being located at the front end of the articulator act as a visual check as to whether the ball heads of the pins 11 are properly engaged in the recordings 16a made in the pieces of material 12 when the plates 1 and 2 have been secured to the upper and lower models.

25 The front vertical pins 21 and 23 also act as a check on the proper seating of the upper and lower models all the way down with no interference, since the operator cannot actually see the ball heads of the pins 11 in the recording grooves 16a. The pins 21, 23 are also useful for forming a fourth recording generated by the three ball-headed pins so as to better visualise how accurately the operator is manipulating the instrument.

30 It will be appreciated from the foregoing that in common with the invention of my Application No. 31092/62 (Serial No. 1,040,296), the present invention provides apparatus whereby three dimensional recordings are made by the use of means actuated by movements of a patient's jaws.

35 It will further be appreciated from the foregoing that in the foregoing apparatus and also the apparatus of Application No. 31092/62 (Serial No. 1,040,296), the recordings made by a patient's jaw movements are not used as guides to record any other tracings elsewhere for use in guiding an articulator, but are used directly in the articulator exactly in the same position relative to the teeth as they were when recorded in the mouth.

WHAT I CLAIM IS: —

1. Dental apparatus for use in obtaining recordings of the movements of a patient's jaws, which recordings are usable for reproducing said movements with models of the patient's jaws, comprising an upper mounting and a lower mounting, means with said mountings by which they are tempor-

65 arily connectable relatively fixedly inside the patient's mouth to the patient's upper and lower jaws respectively, co-acting devices carried by the said mountings adapted to make recordings of relative movements of the patient's jaws for use after removal from the patient's mouth in reproducing such movements with models of the patient's jaws.

2. Dental apparatus for use in obtaining recordings of the movements of a patient's jaws in order to be able to use the recordings for reproducing said jaw movements with previously prepared models of the patient's jaws, wherein said apparatus comprises an upper support member and a lower support member fixable inside the patient's mouth to the patient's upper and lower jaws respectively and transferable to corresponding parts of the models of the jaws, one of said supports carrying scribes and the other being adapted to carry a mouldable material in which the scribes trace three-dimensional recordings representative of the movements of the patient's jaws, whereby upon hardening of the mouldable material subsequent to the formation of said recordings, the models with the said supports secured thereto will be displaceable under the control of the inter-engaging scribes and the said recordings, to reproduce the said movements of the patient's jaws.

3. Dental apparatus for obtaining recordings of movements of a patient's jaws, in order to be able to use the recordings for reproducing said jaw movements mechanically, comprising a pair of thin rigid plates shaped for location parallel with each other between the palate and tongue of the patient, positionally adjustable anchorage members at the peripheries of said plates to secure them to the upper and lower models of the patient's dentures and to locate the said plates in corresponding positions in the patient's mouth, a pair of mounts for said plates adapted to be secured relatively fixedly to the palate and tongue areas of the two models, means to secure said plates temporarily fixedly to said mounts, a plurality of scribes in the form of stems projecting from one of said plates towards, when in use, the other of said plates and formed with part spherical free ends, means in the other of said plates to receive in opposition to each of said stems a charge of recording wax in which the free ends of the said stems are engaged to make the recordings, and resilient means interposable between said plate to yieldingly oppose bite actions of the jaws of the patient, said stems by their free ends being adapted to form in respective ones of said recording wax charges intaglio guideways representative of the movements of the patient's jaws.

4. Apparatus as claimed in Claim 2 or Claim 3, wherein said scribes extend at an

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inclination outwardly away from the plate carrying them.

5 Apparatus as claimed in any one of the preceding Claims, wherein a compression spring is provided and adapted to be engaged at its ends in opposed recesses in the upper and lower plates.

10 6. Apparatus as claimed in any one of the preceding Claims, wherein the said plates are provided with means to anchor relatively fixedly but temporarily therein a plurality of legs which, when secured to the plates, project outwardly as a plurality thereof from the periphery of each of the said plates, their free ends being adapted to be secured in selectable parts of the patient's jaws and of the models.

20 7. A model holder for use with apparatus as claimed in any of the preceding Claims, comprising a lower bow frame or plate provided in its upper face with means to have secured thereto by plaster the lower model, an upper bow frame or plate provided on its lower face with means to have secured thereto by plaster the upper model, an upstanding support for the upper bow frame or plate secured to the rear end of the lower bow frame or plate, and provided at its upper end with means to articulate the upper bow frame or plate thereto, said upstanding support being adjustable in effective height, wherein the said support comprises a pair of vertical sleeves secured at their

lower ends to the rear end of the base bow frame or plate and receiving telescopically rods which at their upper ends are provided with heads having V notches to receive pivotally a centric record pin carried at the rear end of the upper bow frame or plate. 35

8. A model holder as claimed in Claim 7, including with the upper and lower bow frames or plates opposed relatively adjustable members for pre-setting the position of the upper bow frame or plate relative to the lower bow frame or plate. 40 45

9. A model holder as claimed in Claim 8, wherein said setting means comprises a pair of pins upstanding one from the front and one from the rear of the base bow frame or plate and in axial alignment therewith a pair of pins adjustable axially relative to fastening means carried by the upper bow frame or plate. 50

10. Dental apparatus for use in recording and reproducing the movements of a patient's jaw, substantially as hereinbefore described with reference to and as illustrated by the accompanying drawings. 55

For the Applicant,
G. F. REDFERN & COMPANY,
177 Preston Road, Brighton
and
38 Chancery Lane,
London, W.C.2.

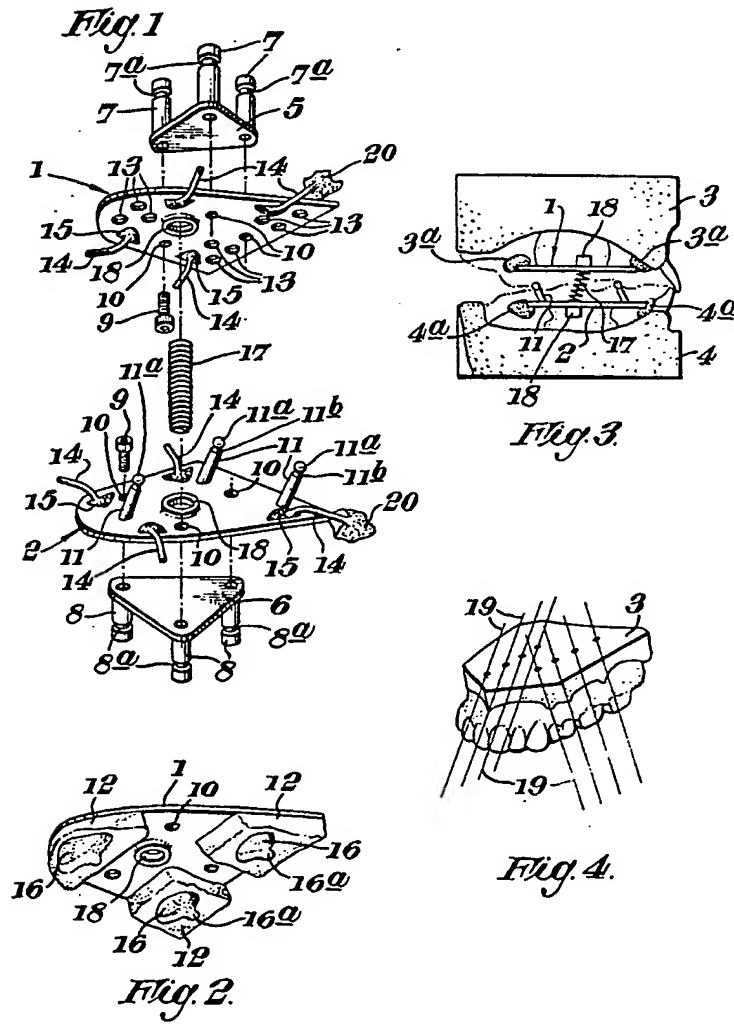
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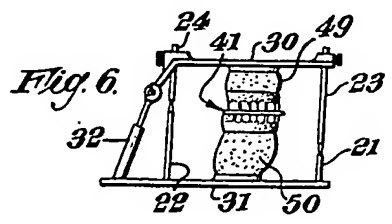
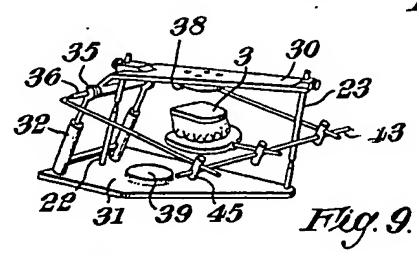
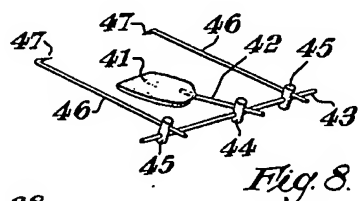
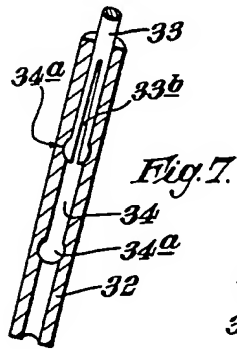
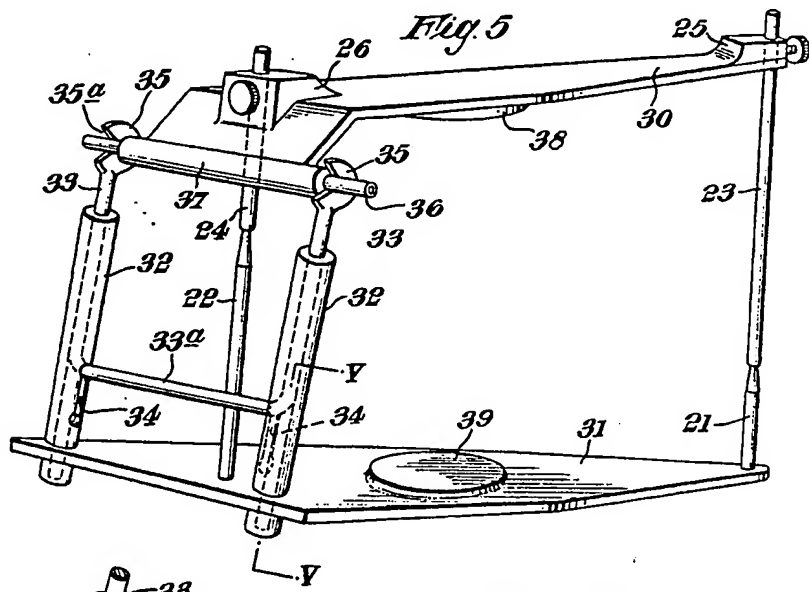
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Sheet 2



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